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For the work itself we have only praise. It is an important contribution to comparative physiology.

ROBERT YERKES.

HARVARD UNIVERSITY.

A Course in Invertebrate Zoology. A Guide to the Dissection and Comparative Study of Invertebrate Animals. By HENRY SHERRING PRATT, Professor of Biology at Haverford College and Instructor in Comparative Anatomy at the Marine Biological Laboratory of the Brooklyn Institute of Arts and Sciences at Cold Spring Harbor, L. I. Boston, Ginn & Co. 1902.

Dr. Pratt's 'Invertebrate Zoology' is strictly a laboratory book, intended to give the student all the information and directions which are needed for the intelligent laboratory study of animals, and nothing more. In this the author has as a rule succeeded admirably. His attempt is to give such practical directions that the student can go on with his work profitably without having an instructor at his elbow. In carrying out this attempt he has not hesitated to give directly such information as is necessary to enable the student to do the work intelligently, and has not attempted to disguise his information under the form of questions—a ruse which has proved so disfiguring to many of the recent laboratory manuals. The absence of pedagogical fads is in fact noticeable and refreshing. The information given is chosen judiciously to accomplish the purpose for which it is intended. There are no figures in the book, as the laboratory work takes largely the form of drawing the careful dissections made, and the author has doubtless experienced the strong tendency of students to imitate the figures of the text. Commendably explicit directions are given for making these drawings.

The plan adopted is to study each one of the larger groups of invertebrates as a whole, several of its representatives being dissected in such a way as to bring out relationships. The first group taken up is the Arthropoda, including study of a wasp, a beetle, a grasshopper, a caterpillar, a centipede, the crayfish or lobster, a crab, a sow-bug, an amphipod,

Caprella, larval decapods, a copepod, *Daphnia*, and a nauplius larva. Somewhat less extensive studies are undertaken of the Annelida, the flatworms, Bryozoa, Mollusca, Tunicata, Echinodermata, Cnidaria, sponges and Protozoa. While the directions are comparative, the author has tried to make those for each organism complete, so that every teacher may take up the forms in such order as he chooses. Doubtless most teachers would desire to modify the directions in some points to suit their own methods of work; a lack of precision to be noticed in some cases in the directions for the dissection of some of the more difficult systems of organs may thus be remedied. The main body of the book is followed by an outline of animal classification and a glossary of the terms used in the directions.

The book will certainly be found very useful both to teachers of invertebrate zoology and to those attempting without the aid of a teacher to obtain some practical knowledge of the anatomy of invertebrates. While the well prepared teacher can usually work best with laboratory directions which he has himself prepared, even this class will find the book suggestive and helpful.

H. S. JENNINGS.

ANN ARBOR, MICH.,

April 16, 1903.

SOCIETIES AND ACADEMIES.

GEOLOGICAL SOCIETY OF WASHINGTON.

At the 141st meeting of the society, held in the assembly hall of the Cosmos Club, Wednesday evening, March 25, 1903, three interesting papers were presented.

Under the title 'Statics of a Tidal Glacier,' Mr. G. K. Gilbert said in part:

"An iceberg floats in sea water with about seven eighths of its mass submerged. A glacier entering an arm of the sea with a depth less than seven eighths the thickness of the ice continues to rest on the bottom. In the discussion of the origin of fiords it is generally assumed that such a glacier is partly sustained by the sea water, and that the rock bed is to the same extent relieved of ice pres-

sure. A little consideration shows that the water pressure against the vertical front of the glacier has no sustaining power. The ice can be hydrostatically supported only through pressure communicated to its under surface. If there is water contact throughout the base of the glacier, then no share of the weight of the ice is directly borne by the rock bed, but the whole weight comes upon the water; and since earth heat keeps the base of a glacier at the temperature of melting, there must always be a film of water beneath it. This film is not expelled by the pressure to which it is subjected, but is reduced to capillary thinness. It does not obey the hydrostatic law, but the laws of surface tension. The molecular forces associated with its two contact surfaces are dominant, and give it quasi-solid properties. The film sustains the whole weight of the superincumbent ice, and communicates its pressure to the rock bed, and this without reference to the absence or presence of sea water. The pressure conditions at the base of the tidal glacier are practically the same in its tidal portion and its land portion, and it has the same power to erode its bed below sea level as above."

It follows, as a corollary, that the existence of a fiord is not *prima facie* evidence that the land had a different relation to sea level at the time of its excavation.

Mr. Whitman Cross, 'Observations on Hawaiian Geology.'

Mr. Cross gave a brief sketch of the geology of the Hawaiian Islands, and described the small but interesting eruptions of Kilauea which have occurred within the past year. Special attention was called to the long series of eruptions of basaltic lavas which has continued from some unknown date in the Tertiary to the present time. That no other lavas should have alternated with basalt and that no apparent progressive change in the characters of the lavas has taken place, contrasts markedly with the history of most volcanic centers. The discovery of trachytic rocks at one point on the island of Hawaii, announced by Mr. Cross, is but the exception proving the rule. In all the older, much

dissected islands, no such unusual lavas have been found.

Mr. Cross spoke of the exceptional opportunities for the study of physiographic processes, since the various islands exhibit all stages in the sculpturing and degradation of volcanic mountains from the unmodified dome of Mauna Loa to the islet, hardly more than a reef, the remnant of a former basaltic volcano.

The recent eruptive activity of Kilauea, beginning in June, 1902, was confined to the pit crater of Halemaumau. This pit is 1,200 to 1,500 feet in diameter, and was about 1,000 feet deep before the lava appeared in its bottom, last June. The sum total of many small gushes of lava up to the end of 1902 was enough to fill up the pit to a distance between 700 and 800 feet below the crater rim.

Mr. Bailey Willis, 'Post-Tertiary Deformation of the Cascade Range.'

Mr. Willis discussed the form of the mountain block which had been elevated (or left in relief through general subsidence) in the development of the Cascade Range. The conception of form was arrived at through study of a warped peneplain of post-Miocene age, which over a wide area is now elevated to altitudes of 3,000 to 8,500 feet. The criteria applied to test the deductions as to form are of a physiographic nature; streams are found to be in part antecedent, in part consequent, and in part adjusted through piracy. In valley profiles there are recognized monadnocks, the peneplain, the post-peneplain mature topography, and the still later canyon topography, the last antedating the latest glacial epoch. Lake Chelan, the central feature of the district discussed, is found to have a complex history, having developed through stream robbing as an extensive canyon, and having been excavated to a depth of a thousand feet below its rock rim by glacial erosion, under peculiar conditions of constriction and pressure of the ice.

The subject discussed will be illustrated in a forthcoming professional paper of the Geological Survey.

W. C. MENDENHALL,
Secretary.

THE SOCIETY FOR EXPERIMENTAL BIOLOGY AND
MEDICINE.

THE third meeting of the Society for Experimental Biology and Medicine was held on the evening of April 15, in Professor Graham Lusk's laboratory at the University and Bellevue Hospital Medical College, New York City. Dr. S. J. Meltzer presided.

In harmony with the aims of the society the evening was devoted mainly to reports of original work done by the members, with demonstrations of methods and results. The program was as follows: *

I. REPORTS OF ORIGINAL WORK, WITH DEMONSTRATIONS.

Changes in the Blood-volume of the Vein of the Submaxillary Gland on Stimulation of the Chorda Tympani and Sympathetic Nerves: R. Burton-Opitz.

Dr. Burton-Opitz explained the mechanism of a recording stromuhr by means of which he made quantitative determinations of the blood flow in the vein conveying the blood from the submaxillary gland. The blood-volume was measured previous to, as well as during, the stimulation of the secretory nerves. The curves which were exhibited showed very striking changes in the blood-flow, namely, an increase on stimulation of the chorda and a decrease when the current was applied to the sympathetic fibers. In the former case the volume of the blood flow (cubic centimeters per second) was from about two to nearly six times as great as normal, and in the latter case it was from about one half to one fifth the normal volume. By using a strong stimulus a complete cessation of flow can be produced.

* The secretary has received an abstract of each report from the member making it, and in editing these abstracts has made only occasional verbal and minor alterations in them, such as abbreviations and the like. The abstracts here given are in fact, therefore, the contributions of the several members themselves, and should be so credited. This statement applies to the former report also (SCIENCE, XVII., p. 468), and will be true of those in the future.

Does a Backward Flow ever occur in the Veins?: R. Burton-Opitz.

The results of this investigation may be summarized as follows: A backward swaying of the column of blood in the central veins is a constant, normal phenomenon. It is produced by two factors: first, by the contraction of the right side of the heart, and secondly, by high intra-thoracic pressure (forced expiration). If the distal conditions in the venous system are favorable, this backward movement can also be obtained in the peripheral veins (femoral vein). The same instrument was used in this investigation as in the former.

A New Method of Studying Metabolism: Gary N. Calkins.

Dr. Calkins described experiments now in progress upon metabolism in unicellular animal organisms. These forms, reproducing by simple division, offer the same protoplasm for study, generation after generation, and, with each division, the daughter organisms, by reason of the functions of regulation and regeneration, perfect themselves in the race-type, while digestion, assimilation, waste, repair and growth are handed down unchanged from cell to cell. The problem is to ascertain whether these various functions will continue their activities indefinitely or whether protoplasmic old age will supervene to put an end to the race. In nature such an end is prevented by sexual union, whereby the conjugating organisms are rejuvenated.

In the experiments this function was prevented by isolation. The general metabolic functions *wore out* four consecutive times at intervals of six months, and each time, except the last, the race was saved only by a change in diet or by chemical stimuli. The phenomena were analogous to those in the artificial fertilization experiments of Loeb and others, with this difference, that, if comparable with artificial parthenogenesis, the process was repeated with the same protoplasm three consecutive times. In the fourth period of degeneration the stimuli previously tried were no longer effective and the race died out, 742 generations old. Structural changes were different in the different periods of depression.

The degenerate animals, in the periods which were successfully overcome, had curiously altered nuclei and endoplasm. In the last period of depression which was not overcome, the nucleus and endoplasm were normal, while abnormal parts were found in the micronucleus and the cortical plasm.

The conclusions which this part of the work seems to justify are: (1) That 'old age,' so-called, of the cell, may be due either to the wearing out of functions, or to the degeneration of structural parts. The former is capable of artificial rejuvenescence, the latter apparently not. (2) The ordinary functions of metabolism, such as digestion, assimilation, excretion, growth, etc., are dependent upon certain definite portions of the cell (macronucleus and endoplasm), while the dividing energy is a function of the micronucleus and of the cortical plasm. (3) After conjugation, the organisms start with high potentials of metabolic energy which gradually wear out, but which can be restored artificially. So, too, the dividing energy starts with a high initial potential energy, but which can not be restored after exhaustion.

In the light of these experiments it would be pertinent and instructive to ascertain whether artificial parthenogenesis, in sea-urchins for example, could be repeated more than once on the same continuous protoplasm. On *a priori* grounds a successful result would be extremely doubtful.

On the Origin of Cholesterin in Gall-stones: C. A. Herter.

Dr. Herter said that experiments made in his laboratory by Dr. Wakeman give strong support to the view that inflammatory conditions of the walls of the gall-bladder may lead to an increase in the cholesterin of the bile. Dr. Wakeman injected strong solutions of bichloride of mercury into the gall-bladders of dogs previously starved for three days. After periods of from two to five days the animals were killed. As a rule, the gall-bladder walls were much thickened and the epithelium was proliferated and desquamated. The solids of the bile were diminished in percentage. The cholesterin content was much increased. The contents of the gall-bladder

in these experiments were sterile. These facts are of great interest in relation to the etiology of gall-stones.

On Nucleic Acid: P. A. Levene.

According to Osborne, nucleic acid derived from the plant cell differs from that of the animal cell with variation in the characters of the pyrimidin base present in its molecule. Dr. Levene has devised a new method of separating the pyrimidin bases, in which he avoids the precipitation with silver. With this method he has obtained from the animal nucleic acid (derived from the spleen and pancreas), besides thymine and cytosine, also uracil. The radical of the latter substance had been supposed to occur only in the plant nucleic acid. Kossel and Stendel have made the same observation in regard to the nucleic acids derived from the thymus gland and from fish sperm.

Respiration Experiments in Phlorhizin Diabetes: Graham Lusk (with A. R. Mandel).

An experiment on a diabetic dog showed that whether fasting, or fed on meat alone, or on meat and fat, no more fat was burned than in the same dog when he was normal and fasting.

A Modified Eck Fistula, with a Note on Adrenalin Glycemia: A. N. Richards.

A method devised by Vosburgh and Richards for establishing communication between the portal vein and the inferior vena cava of the dog was described and demonstrated. In this method two cannulas are employed. They are constructed on the same principle as the one used by Vosburgh and Richards in collecting blood from the hepatic and portal veins without interfering with the normal circulation in those vessels (*Amer. Journ. Physiol.*, 1903, IX., p. 43). After suitable incision through the abdominal wall a cannula of that type, 1 cm. long, was inserted into the portal vein about 2 cm. below the entrance of the pancreatico-duodenalis. A second cannula of similar design was introduced into the vena cava at a corresponding point. By connecting the cannulas with a rubber tube, communication was established between the two vessels. On ligating the hepatic arteries and the portal vein at the

hilum of the liver, circulation through the liver ceased and the gland was extirpated.

By the successful use of this method Vossburgh and Richards have found that the application of adrenalin to the surface of the pancreas brings about a slight rise in the sugar content of the blood even after extirpation of the liver. Their experiments thus far have covered periods of from two to three hours, no systematic attempts having yet been made to get the animals to survive the operation.

II. REVIEW.

Aims and Achievements in Recent Experimental Cytology: Gary N. Calkins.

A review of Loeb's, Wilson's and Boveri's experimental researches.

WILLIAM J. GIES,
Secretary.

NEW YORK ACADEMY OF SCIENCES.

SECTION OF BIOLOGY.

THE fourth meeting of the year was held at the American Museum of Natural History on April 13, Professor Bashford Dean presiding. Papers were read by Dr. A. G. Mayer on 'The Instincts of Lepidoptera' and Professor H. E. Crampton on 'Variation and Reproductive Selection in Saturnid Moths.' Abstracts of these papers follow.

The paper presented by Dr. Mayer was a mere preliminary account of certain observations made by the writer. It is planned that the research will be continued and finally published conjointly with Miss Caroline G. Soule. Certain lepidopterous larvæ, such as *Danaus plexippus*, are negatively geotactic and positively phototactic toward the ultra-violet rays. The combination of these reactions in nature maintains the larva at or near the top of its food plant, where, incidentally, it finds the youngest and best leaves, and tends to prevent its crawling down and away from the plant, thus incurring risk of starvation. Other larvæ, such as *Pyrrharctia isabella*, are indifferent either to the attraction of gravitation or to ordinary variation in conditions of light. Others react differently at different stages of development. Larvæ which will

devour only certain definite species of leaves may be induced to eat sparingly of any other sort, provided the instinct to eat be first set into operation by the presence of the proper food plant. Under such conditions about the same number of bites are taken upon each presentation of the uneatable food to the larva. This phenomenon may be called 'momentum of the reaction,' and inclines one to conclude that the eating reaction is probably an unconscious reflex. Another series of experiments appeared to show that larvæ are unable to learn to follow a definite path to their food, and that the associative memory of lepidopterous larvæ does not endure for as long a time as ninety seconds. Certain larvæ when about to pupate display a well-marked geotropism.

The mating instinct is called into play by the perception of the characteristic odor of the female, and is merely a phenomenon of chemotaxis uncomplicated by æsthetic appreciation or sexual selection on the part of the female.

Professor Crampton described briefly the principal results of a statistical study of the correlation between structural characteristics and reproductive ability or disability in *Samia cecropia*. It was shown that the pupæ of those individuals, male and female, which mated were different from those which failed to mate, although all were placed under the same conditions as far as possible. True reproductive selection was evident, and related to typical conditions as well as to variabilities. A brief discussion was given of the real basis for the selective process and of the relation between reproductive selection manifested after emergence to that selection which occurred during pupal existence.

M. A. BIGELOW,
Secretary.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

At the meeting of the section on April 6, P. H. Dudley, C.E., Ph.D., of the New York Central and Hudson River Railroad, read a paper full of interest to those familiar with American railroad methods, on 'Stremmato-

graph Tests: Principles and Facts Relating to the Distribution of the Strains in the Base of Rails under Moving Trains.' This paper is published above.

S. A. MITCHELL,
Secretary.

COLUMBIA UNIVERSITY GEOLOGICAL JOURNAL CLUB.

March 27.—Professor Grabau reviewed a paper by F. Noetling on 'Beiträge zur morphologie der Pelecypoden' (*Neues Jahrbuch*, 1902). Mr. C. W. Dickson reviewed the Quebec Group, especially in reference to its history and correlation.

April 3.—Professor Kemp reviewed several late papers from the *Transactions of the American Institute of Mining Engineers*.

April 17.—Professor Kemp exhibited and made a few remarks on the late folios of the U. S. Geological Survey. He also gave a short summary of 'The Two Islands,' an interesting book by Professor Thomas Condon, professor in geology in the University of Oregon. Professor Condon discussed in a semi-popular manner the geological history of these Archean islands, the one in the south-east and the other in the northwest part of Oregon. Dr. G. I. Firflay reviewed a paper by W. M. Davis on the 'River Terraces in New England' (*Bull. of Mus. of Comp. Zool.*, Vol. 38). Mr. C. W. Dickson reviewed several late papers from the *American Institute of Mining Engineers*. H. W. SHIMER.

AMERICAN CHEMICAL SOCIETY.

NORTHEASTERN SECTION.

THE forty-fourth regular meeting of the section was held at the rooms of the Technology Club, Boston, Friday, April 24, at 8 P.M. President A. H. Gill in the chair. Seventy-five members were present.

Mr. George W. Priest addressed the section on 'The Manufacture of Chrome Leather,' describing the usual method of preparing the raw hide for tanning, and the two methods used for chrome tanning, known as the one-bath and two-bath processes. The lecturer also described the new process for making patent leather from chrome-tanned skins, and

exhibited specimens of leather tanned in various ways. The address was followed by a general discussion of the subject by members interested in the tanning industry.

ARTHUR M. COMEY,
Secretary.

PSYCHOLOGICAL CLUB OF CORNELL UNIVERSITY.

THE following papers have been read during the session of 1903:

MR. B. L. ANDREWS: 'Tests of Audition: Clinical, Anthropometrical, Psychophysical.'

DR. J. W. BAIRD: 'The Influence of Convergence and Accommodation upon the Perception of the Third Dimension.'

PROFESSOR I. M. BENTLEY: 'Clearness as an Attribute of Sensation'; 'Experimental Aesthetics.'

DR. L. P. BOGGS: 'Mental Elements and Mental Units.'

DR. M. E. SCHALLENBERGER: 'Mind in the First Week of Infancy.'

MR. H. C. STEVENS: 'The Physiological Factors in the Normal Plethysmogram.'

PROFESSOR TITCHENER: 'The Method of Minimal Changes'; 'The Law of Error'; 'The Method of Average Error'; 'The Method of Right and Wrong Cases.'

DISCUSSION AND CORRESPONDENCE.

WALBAUM AND BINOMIALISM.

MR. HENRY W. FOWLER, in *SCIENCE* for April 10, 1903 (p. 595), has expressed the opinion that 'Walbaum is non-binomial.' This assertion involves the names of many of our most common fishes and would necessitate numerous changes in nomenclature if true. Therefore, a restatement of facts in question appears to be called for. In fact, Walbaum is as binomial as Linnaeus, if not more so.

Linnaeus himself did not regard what is now called binomial nomenclature of much importance; indeed, he considered it to be simply a device for temporary purposes or for the facilitation of tabulation. What he did take pride in and credit for was the use of the specific name ('nomen specificum'), but this so-called name was not binomial, but of the nature of a diagnosis; really it was a diagnosis, as he claims: 'Nomen specificum est itaque differentia essentialis.' This was his boast: 'Primus incepti nomina specifica es-